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Docket No.: GR 00 P 1583

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**MAIL STOP: APPEAL BRIEF-PATENTS**

By: ______________________ Date: December 12, 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Before the Board of Patent Appeals and Interferences

| | | | |
|---|---|---|---|
| Applic. No. | : | 09/817,963 | Confirmation No.: 9891 |
| Inventor | : | Klaus Lowack, et al. | |
| Filed | : | March 27, 2001 | |
| Title | : | Method for the Metallization of an Insulator and/or a Dielectric | |
| TC/A.U. | : | 1762 | |
| Examiner | : | Brian K. Talbot | |
| Customer No. | : | 24131 | |

Hon. Commissioner for Patents
Alexandria, VA 22313-1450

## BRIEF ON APPEAL

Sir:

This is an appeal from the final rejection in the Office Action dated July 12, 2006, finally rejecting claims 4-8.

Appellants submit this *Brief on Appeal* in triplicate, including payment in the amount of $500.00 to cover the fee for filing the *Brief on Appeal*.

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Real Party in Interest:

This application is assigned to Infineon Technologies of Munich, Germany. The assignment will be submitted for recordation upon the termination of this appeal.

Related Appeals and Interferences:

No related appeals or interference proceedings are currently pending which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

Status of Claims:

Claims 4-8 are rejected and are under appeal. Claims 1-3 were cancelled.

Status of Amendments:

No claims were amended after the final Office action. A *Response under 37 CFR 1.116* was filed on September 12, 2006. An *Advisory Action* was issued on October 11, 2006, stating that the request for reconsideration had been considered but did not place the application in condition for allowance. A *Notice of Appeal* was filed on October 12, 2006.

Summary of the Claimed Subject Matter:

Independent claim 4 reads as follows (the page and line numbers refer to the original application):

A process for metallizing at least one insulating layer (page 4, line 25 – page 7, line 4) of an electronic or microelectronic component, which comprises:



PAGE 2/21 * RCVD AT 12/12/2006 3:31:30 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-3/1 * DNIS:2738300 * CSID:+9549251101 * DURATION (mm-ss):05-28

applying at least one first insulating layer (page 7, line 6) to a substrate (page 3, lines 23-24; page 4, lines 11-12; page 8, line 21-page 9, line 2) such that the first insulating layer has a thickness not greater than 50μm (page 3, lines 18-21; page 5, lines 13-14);

activating the first insulating layer by treatment with an activator (page 3, lines 23-24; page 4, lines 6-9; page 7, line 6-page 8, line 19), the activator being at least one of a gas, a liquid, a solution, and a plasma (page 7, lines 22-23);

then after activating the entire first insulating layer, applying to the first insulating layer a second insulating layer made of a photosensitive material (page 4, lines 17-21; page 11, line 12; page 12, lines 23-25; page 16, lines 3-6), and patterning the second insulating layer made of a photosensitive material (page 7, lines 6-13); and then, after applying and patterning the second insulating layer, seeding (page 4, lines 22-23; page 11, lines 13-17; page 12, first paragraph; page 15, lines 2-6) and metallizing (page 15, lines 10-12) regions of the first insulating layer that are exposed by the patterning step. As stated in the first paragraph on page 1 of the specification of the instant application, the invention relates to a process for the metallization of an insulator and/or a dielectric.

Example 1

Appellants explained on page 11, line 6, that a commercially available wafer with an already cyclized polyimide coating is wired as follows: the polyimide is activated by a short etching operation lasting 25 s in an oxygen plasma (500 W, 50 sccm oxygen, 50 mtorr). The activated wafer is immersed for 10 s in deionized water, the water is spun

off and the wafer is dried for 60 s at 120?C. A second coat of a photosensitive polyimide is then spin-coated on, patterned and baked in an oven at 400?C under nitrogen. The plasma activation of the first layer creates the activated surface, to which the palladium complex can bind selectively (seeding) by immersion in a solution of 200 mg ç$^2$-bipyridyl-ç$^2$4,4?-diaminostilbenopalladium(II) in 500 ml of isopropanol. The palladium complex is then reduced (RT, 2 min) by immersion in an alkaline borohydride solution (1 g of sodium borohydride, 5 g of sodium hydroxide dissolved in 1000 ml of water). The chemical copper deposition is then carried out by immersion (10 min) in a warm commercially available copper bath.

Example 2

Appellants explained on page 12, line 1, that the seeding is carried out as in Example 1, but in this case the selectively coupled palladium complex is reduced photochemically to form a cyclobutane derivative ($C_4(C_6H_4NH_2)_4H_4)$) and palladium(0). For this floodlighting (exposure without a mask at an exposure energy of 300 mJ/cm$^2$), a polychromatic energy source with emissions in the range of 200-500 nm is used, e.g. a high-pressure mercury lamp.

Example 3

On page 12, line 11, appellants explained that in the process as in Example 1, the corresponding platinum(II) complex is used instead of the palladium(II) complex. The result is similar.

Example 4

Appellants explained on page 12, line 17, that in the process as in Example 1, the

di-i-chloro-tetraethylenedirhodium(I) complex is used instead of the palladium(II) complex. The result is similar.

Example 5

On page 12, line 23, appellants explained that a photosensitive polyimide is, according to the manufacturer's specifications, spin-coated onto a silicon substrate, exposed, developed and cured. To activate the polyimide, the substrate is then immersed in the following solutions:

- 10 min in an alkaline permanganate solution, consisting of 140 g/l sodium permanganate and 50 g/l sodium hydroxide, at a temperature of 40?C
- washing in deionized water
- immersion for 3 min at room temperature in semi-concentrated sulphuric acid (5 mol/l)
- washing in deionized water.

On page 13, line 13, appellants outlined that a second coat of polyimide is then spin-coated on and, as described above, patterned and cured. The bare positions on the first, activated polyimide layer are seeded by immersing the substrate for 45 min in a commercial ionogenic palladium solution at a temperature of 45?C. After washing with deionized water (immersion 3 s), the ionogenic palladium is reduced by an alkaline borohydride solution, consisting of 1 g of sodium borohydride and 5 g of sodium hydroxide per 1 l of deionized water. After washing again with deionized water and drying in a nitrogen stream, the chemical metallization is carried out by 15 min of immersion in a commercially available nickel bath.

Example 6

Appellants explained on page 14, line 1, that instead of the nickel bath, a commercially available copper bath is used. Otherwise as in Example 5.

Example 7

On page 14, line 6, appellants outlined that the dielectric polybenzoxazole is applied to a silicon wafer by the spin-coating technique, pre-dried at 100?C and cured on a hotplate for 1 min each at 200?C, 260?C and 350?C under nitrogen. The surface is then activated in a water-gas plasma ($CO:H_2$ as 1:1; 500 watts, 50 sccm, 50 mtorr). The activated surface is immersed for 10 s in deionized water, the water is spun off and the wafer is dried for 60 s at 120?C. A second coat of polybenzoxazole is then applied by screen printing, pre-dried and - as above - cured. The plasma activation creates a surface containing carboxyl groups, to which the palladium complex can bind selectively by immersion in a solution of 200 mg ç$^2$-bipyridyl-ç$^2$4,4?-diaminostilbenopalladium(II) in 500 ml of isopropanol. The palladium complex is then reduced (RT, 2 min) in an alkaline borohydride solution (1 g of sodium borohydride, 5 g of sodium hydroxide dissolved in 1000 ml of water). The chemical copper deposition is then carried out using a commercially available copper bath.

Example 8

Appellants explained on page 15, line 1, that similar to Example 7, but the activation is carried out by plasma with forming gas ($N_2$, $H_2$ (1:1)). Then, however, the seeding is performed with a solution of 200 mg ç$^2$-bipyridyl-4,4?-dicarboxy-ç$^2$-stilbeno-palladium(II) in 500 ml of isopropanol, to which 0.5 ml of aqueous ammonia (24%) was added.

Example 9

Appellants explained on page 15, line 10, that similar to Example 7, but the activation is carried out by plasma with ammonia. Then, however, the seeding is performed with a solution of 200 mg
ç²-bipyridyl-4,4?-dicarboxy-ç²-stilbenopalladium(II) in 500 ml of isopropanol, to which 0.5 ml of aqueous ammonia (24%) was added.

Appellants explain on page 15, line 16, that the figure shows a detail of a component such as a wafer, 4 layers being visible in cross section: at the bottom the substrate 1, on top of which is the insulating layer 2 which is activated. The insulating layer 3 is patterned and therefore leaves some of the surface of the activated layer 2 bare. On the bare surface, the insulating layer 2 is covered with the metallic conductive strip 4 by seeding and metallization.

On page 15, line 24, the appellants outlined that the invention permits inexpensive, selective metallization of an insulating layer without stripping or etching-back. The range of application of the process is very versatile, because there is no restriction in terms of the insulator which is used. Furthermore, a wide variety of insulators can be combined. The exposure energies when photosensitive materials are used are low and the printing times when non-photosensitive materials are used are short so that a good throughput is achieved. The process is compatible with existing process lines because, when photosensitive insulators are used, the exposure for activation can be carried out in the near or far UV range (200 to 450 nm, in particular the range of from 350 to 450 nm), and illumination devices already existing in the process line can

hence be used to save cost. The polymer of the insulator is not degraded and/or cleaved by the activation, so that no low-molecular waste products are created.

Appellants explained on page 16, line 15, that the invention relates to a process for the metallization of an insulator and/or a dielectric, wherein the insulator is firstly activated, it is subsequently coated with another insulator and the latter is patterned, then the first is seeded and lastly metallized.

References Cited:

| | | |
|---|---|---|
| US Patent No. 5,468,597 | Calabrese et al. | Nov. 21, 1995 |
| US Patent No. 5,679,498 | Greenwood et al. | Oct. 21, 1997 |
| US Patent No. 5,800,858 | Bickford et al. | Sept. 1, 1998 |

Grounds of Rejection to be Reviewed on Appeal

1. Whether or not claims 4-8 are obvious over Calbrese et al. in combination with Greenwood et al. and in further combination with Bickford et al. under 35 U.S.C. § 103.

Grouping of Claims:

Claim 4 is independent. Claims 5-8 depend on claim 4. The patentability of claims 5-8 is not separately argued. Therefore, claims 5-8 stand or fall with claim 4.

Argument:

Before discussing the prior art in detail, it is believed that a brief review of the

invention as claimed, would be helpful. Claim 4 calls for, *inter alia,* a process for metallizing at least one insulating layer of an electronic or microelectronic component, which comprises:

applying at least one first insulating layer to a substrate such that the first insulating layer has a thickness not greater than 50μm;

activating the entire first insulating layer by treatment with an activator, the activator being at least one of a gas, a liquid, a solution, and a plasma;

**then, after activating the entire first insulating layer, applying to the first insulating layer a second insulating layer made of a photosensitive material, and patterning the second insulating layer made of a photosensitive material;** and then, after applying and patterning the second insulating layer, seeding and metallizing regions of the first insulating layer that are exposed by the patterning step. (emphasis added)

Calabrese, as stated by the Examiner, discloses preparing a substrate, forming ligating groups over the substrate, forming a photoresist, and imaging over the ligating layer, selectively applying a seeding layer to the ligating layer and plating (col. 3, lines 40-55). The photoresist also may be applied to the substrate prior to applying the ligating layer. The substrate is silicon.

The Examiner states that the claimed "activating step" is achieved by the prior art by "ligating layer" (of Calabrese).

Greenwood, as stated by the Examiner, discloses a method for producing high density multi-layered integrated circuits carriers. Coating a base surface with a photosensitive dielectric material, curing and developing the photosensitive dielectric layer, depositing a catalyst to form a sensitized dielectric layer, applying a photoresist layer, developing and curing the photoresist layer, forming conductors on the exposed dielectric layer and repeating the steps (abstract and col. 8, lines 10-35). The photosensitive layer has a thickness of 0.0007-0.0009 inches. The imaging and patterning is performed on both dielectric layers (photosensitive and photoresist).

The Greenwood disclosure (at col. 8, lines 11-33) relied upon by the Examiner in the rejection states:

"The cured dielectric top surface 81 provides a mounting surface for conductor circuitry. In accordance with the instant invention, copper conductors are formed on the dielectric surface by the following additive process. First, the dielectric surface is chemically sensitized by a process that prepares the dielectric surface such that copper readily adheres thereto. As illustrated in FIG. 14, a layer of photoresist 110 is then applied over the sensitized dielectric layer 80 and allowed to dry. Next, as best illustrated in FIG. 15, the photoresist layer 110 is masked with a transparent sheet 100 containing *opaque* areas 102 corresponding to the desired circuitry layout. The masked photoresist is exposed to ultra-violet radiation source 70 thereby causing exposed portions of photoresist to cure. The partially cured photoresist layer is developed, as illustrated in FIG. 16, thereby removing uncured

portions, with a suitable chemical solution 74 such that portions 112 of said sensitized dielectric surface, representing areas for conductor circuitry, are exposed. Copper conductors 94a-c are formed upon said exposed, sensitized, dielectric portions 112 by an additive electron process and built-up to a suitable thickness depending on the application (i.e. anticipated current flow), by an electroplating process, thereby forming conductor circuitry."

The Examiner incorrectly equates the "photoresist layer" in Greenwood with the claimed "second insulating layer made of a photosensitive material" recited in claim 4 of the instant application. In col. 3, lines 47-49, Greenwood states "[t]he word "photoresist" refers generally to a chemical coating that cures or hardens with suitable exposure to light or radiation." There is no hint or suggestion or disclosure that the photoresist layer in Greenwood is or could be an insulating layer as recited in the claims of the instant application.

The Abstract of Greenwood mentions "a layer of photosensitive dielectric material". However, the "photosensitive dielectric material" is different from and not the same as the "photoresist" relied upon by the Examiner in Greenwood.

Thus, neither Calabrese nor Greenwood disclose or suggest the claimed feature of **a second insulating layer applied to the first insulating layer.** Therefore, the combined prior art references do not disclose or suggest all the claim limitations required for a prima facie case of obviousness.

Bickford does not overcome the deficiencies of Calabrese or Greenwood or any

combination of Calabrese with Greenwood. Bickford also discloses a method for metallizing insulation layers, where a first insulation layer is activated, and a second insulation is embodied on the first activated insulation layer. The second insulation is subsequently structured so that partial areas of the first activated insulation layer are freed. The partial areas are subsequently seeded and a metallization is then carried out on the embodied seeding. The claimed invention is not disclosed or suggested by a combination of Calabrese and Greenwood with Bickford.

It is accordingly believed to be clear that Calabrese in combination with Greenwood, and further in combination with Bickford, whether taken alone or in any combination, does not show or suggest the features of claim 4. Specifically, the references do not show "after activating the entire first insulating layer, applying to the first insulating layer a second insulating layer made of a photosensitive material, and patterning the second insulating layer made of a photosensitive material" recited in claim 4.

In the Examiner's "Response to Amendment" section on page 4 of the final Office Action, the Examiner stated that "applicant argued that the photoresist layer in Calabrese et al. (5,468,597) is not an insulating layer and that the photosensitive layer in Greenwood et al. (5,679,498) is not the same as a photoresist layer."

Furthermore, the Examiner stated that "[t]he Examiner agrees in part. First off, claims 4, 7, and 8 do **not require** the first and second **insulating layer be of the same material**. Secondly, the rejection is based upon a combination rejection wherein Bickford et al. (5,800,858) teaches a similar process whereby the **first and**

**second polymer layer** can be of the same material. There is no requirement that the motivation to make the combination be expressly articulated in one or more of the references; the teaching suggestion or inference can be found not only in the references but also from knowledge generally available to one of ordinary skill in the art." (emphasis added)

Applicants never asserted or argued that the first and second insulating layer have to be of the same material. In the response dated April 26, 2006, applicants showed that neither Calabrese nor Greenwood disclose the claimed feature of a second insulating layer applied to the first insulating layer.

Contrary to the Examiner's allegation, applicants do not find any disclosure in Bickford of a "first and second polymer layer." The Examiner has not shown where Bickford discloses a "first and second polymer layer". Therefore, it is submitted that Bickford does not disclose a "first and second polymer layer." As discussed above, Bickford discloses methods for treating halogenated polymeric material to render it suitable for subsequent plating. Bickford does not have a need for a product/process, which requires **two** insulating layers.

The Examiner has stated that "...the teaching, suggestion or inference [as a motivation to combine references] can be found not only in the references but also from the **knowledge generally available** to one of ordinary skill in the art..." (emphasis added). However, while that statement may be accurate in a very general sense, the Examiner still must show where such general knowledge exists in the prior art and moreover, how such general knowledge, if it does exist, provides

a rationale basis for the combination of references. It is submitted that, in this instance, the Examiner has not shown the existence of such general knowledge in the prior art (the Examiner has made an unsupported allegation) or, if it does exist, how the general knowledge supports or teaches the combination of references suggested by the Examiner.

Applicants acknowledge that one cannot show non-obviousness by attacking references individually where the rejections are based on a combination of references, as in the present case. However, the other side of this argument is that one cannot argue obviousness where the rejections are based on a combination of references **without a proper teaching in the cited references (or in the knowledge generally available** to one of ordinary skill in the art) suggesting such a combination of references. None of the applied references show or suggest a two-layer process/product as recited in claim 4.

It is a requirement for a *prima facie* case of obviousness, that the prior art references must teach or suggest **all** the claim limitations.

The references do not show or suggest applying to the first insulating layer a second insulating layer made of a photosensitive material, as recited in claim 4 of the instant application.

The references applied by the Examiner **do not** teach or suggest all the claim limitations. Therefore, it is believed that the Examiner has not produced a *prima facie* case of obviousness.

Moreover, a critical step in analyzing the patentability of claims pursuant to 35 U.S.C. § 103 is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. See In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614,1617 (Fed. Cir. 1999). Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher." Id. (quoting W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983)).

Most if not all inventions arise from a combination of old elements. See In re Rouffet, 149 F.3d 1350, 1357, 47 USPQ2d 1453,1457 (Fed. Cir. 1998). Thus, every element of a claimed invention may often be found in the prior art. See id. However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention. See id. Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the appellant. See In re Dance, 160 F.3d 1339, 1343, 48 USPQ2d 163.5, 1637 (Fed. Cir. 1998); In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125,1127 (Fed. Cir. 1984).

The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the

nature of the problem to be solved. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. In addition, the teaching, motivation or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references. See WMS Gaming, Inc. v. International Game Tech., 184 F.3d 1339, 1355, 51 USPQ2d 1385, 1397 (Fed. Cir. 1999). The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981) (and cases cited therein). Whether the Examiner relies on an express or an implicit showing, **the Examiner must provide particular findings related thereto**. See Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617. **Broad conclusory statements standing alone are not "evidence."** Id. When an Examiner relies on general knowledge to negate patentability, that knowledge **must be articulated and placed on the record**. See In re Lee, 277 F-3d 1338, 1342-45, 61 USPQ2d 1430, 1433-35 (Fed. Cir. 2002).

Upon evaluation of the Examiner's comments, it is respectfully believed that the evidence adduced by the Examiner is insufficient to establish a prima facie case of obviousness with respect to the claims. The Examiner has not shown support in the references or the general public knowledge to support his combination of references.

In view of the foregoing, it is believed that claims 4 and dependent claims 5-8 are patentable over the cited prior art, taken individually or in combination.

The honorable Board is therefore respectfully urged to reverse the final rejection of the Primary Examiner.

Respectfully submitted,

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Claims Appendix:

4. A process for metallizing at least one insulating layer of an electronic or microelectronic component, which comprises:

applying at least one first insulating layer to a substrate such that the first insulating layer has a thickness not greater than 50μm;

activating the first insulating layer by treatment with an activator, the activator being at least one of a gas, a liquid, a solution, and a plasma;

then after activating the entire first insulating layer, applying to the first insulating layer a second insulating layer made of a photosensitive material, and patterning the second insulating layer made of a photosensitive material; and then, after applying and patterning the second insulating layer, seeding and metallizing regions of the first insulating layer that are exposed by the patterning step.

5. The process according to claim 4, which comprises forming the first insulating layer and the second insulating layer from the same material.

6. The process according to claim 5, which comprises patterning the first insulating layer before the entire first layer is activated and before the second insulating layer is applied.

7. The process according to claim 4, which comprises patterning the first insulating layer before the entire first layer is activated and before the second insulating layer is applied.

8. The process according to claim 4, wherein the first insulating layer is a buffer coating.

Evidence Appendix:

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or any other evidence has been entered by the Examiner and relied upon by appellant in the appeal.

Related Proceedings Appendix:

No prior or pending appeals, interferences or judicial proceedings are in existence which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal. Accordingly, no copies of decisions rendered by a court or the Board are available.